Joule

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(Redirected from Joules)

The **joule** (symbol: J) is the SI unit of energy, or work with base units of $\mathbf{kg \cdot m^2/s^2}$ ($\mathbf{N \cdot m}$). The base unit conversion can be remembered using the equation $E=mc^2$, where E is in joules, m is in kilograms, and c is the speed of light.

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Definition

The **joule** is a derived unit defined as the work done or energy required, to exert a force of one newton for a distance of one metre, so the same quantity may be referred to as a **newton metre** or **newton-metre** with the symbol $\mathbf{N \cdot m}$. However, the newton metre is usually used as a measure of torque, not energy.

As a rough guide, 1 joule is the absolute minimum amount of energy required (on the surface of Earth) to lift a one kilogram object up by a height of 10 centimetres.

One joule is also:

- The work required to move an electric charge of one coulomb through an electrical potential difference of one volt; or one **coulomb volt**, with the symbol $\mathbf{C \cdot V}$.
- The work done to produce power of one watt continuously for one second; or one **watt second** (compare kilowatt-hour), with the symbol $\mathbf{W \cdot s}$

Conversions

1 joule is exactly 10^7 erg.

1 joule is approximately equal to:

- $6.24150636309 \times 10^{18}$ eV (electron-volts)
- 0.238845896628 cal (calorie) (small calories)
- 2.390×10^{-4} Calorie or kilocalorie (food)
- $9.47817120313 \times 10^{-4}$ BTU (British thermal unit)
- 0.737562149277 ft·lbf (Foot-pound force)
- 23.7 ft·pdl (foot poundals)
- 2.7778×10^{-7} kilowatt-hour
- 2.7778×10^{-4} watt-hour
- 9.8692×10^{-3} litre-atmosphere
- the energy required to lift a small apple (102 g) one metre against Earth's gravity
- the amount of energy, as heat, that a quiet person produces every hundredth of a second.
- the energy required to lift a small apple 10 centimetres (1/10 metre) by converting the heat that the quiet person produced, on a hundredth of second, in work, with 10% efficiency.
- 1/100th of the energy a person can get by drinking a single droplet of beer.

Units defined in terms of the joule include:

- 1 thermochemical calorie = 4.184 J (exact)
- 1 International Table calorie = 4.1868 J (exact)
- 1 watt-hour = 3600 J (exact)
  - 1 kWh = 1 kilowatt-hour = 3.6×10^6 J

History

A joule is the mechanical equivalent of heat meaning the number of units of work in which the unit of heat can perform. Its value was found by James Prescott Joule in experiments that showed the mechanical energy Joule's equivalent, and represented by the symbol J. The term was first introduced by Dr. Mayer of Heilbronn.

See also

This SI unit is named after James Prescott Joule. As for all SI units whose names are derived from the proper name of a person, the first letter of its symbol is uppercase (**J**). But when an SI unit is spelled out, it should always be written in lowercase (**joule**), unless it begins a sentence or is the name "degree Celsius".
— Based on *The International System of Units (http://www.bipm.org/en/si/si_brochure/chapter5/5-2.html)*, section 5.2.

- Conversion of units
- SI prefixes
- Orders of magnitude
- Orders of magnitude (energy)
- Electronvolt
- Watt-hour

References

- The adoption of joules as units of energy (http://www.fao.org/docrep/meeting/009/ae906e/ae906e17.htm), FAO/WHO Ad Hoc Committee of Experts on Energy and Protein, 1971. A report on the changeover from calories to joules in nutrition.

External links

- Conversion of J in other units (http://unit-converter.org/index.php?c_id=2&u_id=17)

Categories: SI derived units | Units of energy